

1. Lidar measurements of tropospheric and stratospheric ozone at Table Mountain Facility, California, and Mauna Loa Observatory, Hawaii: An overview of 10 years of measurements.

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4. Abstract

As part of the Network for Detection of Stratospheric Change (NDSC) three lidars are currently operated by the Jet Propulsion Laboratory (JPL). These systems provide high-resolution vertical profiles of tropospheric and stratospheric ozone and aerosols, and stratospheric and mesospheric temperature, at the JPL-Table Mountain Facility, California (TMF, 34.4°N, 117.7°W), and at the Mauna Loa Observatory (MLO, 19.5°N, 155.6°W).

The original differential absorption lidar system (DIAL) located at TMF has been measuring ozone number density from ~18-50 km and temperature from ~30-75 km, on several nights a week between 1988 and 1999. This system is being upgraded to include Raman scattered channels and to extend the altitude range of the measurements. The profiles obtained by this system since 1988 have allowed investigation of the day-to-day, seasonal, and interannual variability of stratospheric ozone at TMF. The vertical structure shows a clear annual cycle in opposite phase below and above the ozone concentration peak, typical of mid- to subtropical latitudes. High day-to-day variability is also observed in the lower stratosphere, revealing the various effects of the dynamics (laminated structures, tropopause variability, etc.).

A similar stratospheric DIAL system was installed at MLO, Hawaii, in July 1993. This system is using 2 pairs of Rayleigh/Mie channels similarly to the TMF system, and an additional pair of vibrational-Raman channels, allowing ozone, aerosol, and temperature measurements in the lowermost stratosphere (down to 15 km). The profiles obtained since 1993 have also allowed the ozone vertical structure above MLO to be studied. As expected for tropical latitudes the observed ozone concentration tends to be higher during the summer months and lower during the winter months throughout the entire stratospheric ozone layer. A weak signature of the extra-tropical latitudes is observed near 19-20 km in late winter. Large variability has been observed in the lowermost stratosphere, probably connected with the tropical tropopause variability. The ozone Quasi-Biennial Oscillation (QBO), and El Nino and the Southern Oscillation (ENSO) is currently being investigated.

A new tropospheric system has been recently developed at TMF, providing high-resolution ozone profiles between 5-17 km. The combined results of the tropospheric and

stratospheric systems will eventually lead to accurate ozone measurements in a wide 5-55 km range.

An overview of these instruments with emphasis on the atmospheric profiles obtained will be presented.

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5. Topic: (1) Observations and analyses of total and vertical ozone distributions.

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